Algebra 2

I. Understanding Functions

Each of the standards in this section applies to all types of functions studied in this course (quadratic, exponential, absolute value, radical, and rational).

A. Properties of Functions
1. Identify the mathematical domains and ranges of functions for a variety of situations both from graphical, tabular, and algebraic representations.
2. Determine reasonable domain and range values for given problem situations.
3. Collect data and record results, organize the data, make scatterplots, fit the curves to the appropriate parent function using graphing calculator technology and computer software.
4. Recognize that real-world phenomenon can be modeled by specific functions; make predictions, decisions and critical judgments using the model. Graphing calculator technology and computer software are to be used for data organization and curve fitting.
5. Determine changes in slope relative to the change in the independent variable.

B. Solving Equations and Inequalities
1. Analyze situations and formulate systems of equations or inequalities in two or more unknowns to solve problems.
2. Use algebraic methods, graphs, tables, and matrices to solve systems of equations or inequalities; verify solutions using computer algebra systems, spreadsheets, and graphing calculators.
3. Identify the kinds of equations that can and cannot be solved in each subset of the complex number system.
4. Demonstrate that no solution or multiple solutions may exist.
5. Use computer algebra systems, spreadsheets, and graphing calculators to solve linear programming problems.
6. Identify and use properties related to operations with matrices to justify the steps in solving applied problems.

II. Algebra and Geometry

A. Algebraic and Geometric Representations of Functions
1. Identify and sketch graphs of parent functions, including square root ($y = \sqrt{x}$), inverse ($y = 1/x$), exponential ($y = a^x$), and absolute value ($y = |x|$) functions.
2. With and without using a graphing calculator, investigate, describe, and predict the effects of vertical and horizontal translations, reflections, and dilations on parent functions.
3. Perform the composition of functions.
4. Recognize inverse relationships between various functions.

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B. Conic Sections
1. Explain each conic section as the intersection of a plane and cone(s).
2. Identify symmetries from graphs of conic sections.
3. Complete the square to determine the type, shape, and location of a conic section.

III. Quadratic, Square Root, and Absolute Value Functions

A. Quadratic Functions.
1. Represent quadratic functions in algebraic, tabular, graphical, and verbal forms using paper and pencil, graphing calculators, computer algebra, and spreadsheet technologies.
2. Generate a quadratic function from its roots or its graph.
3. Use the parent function to sketch graphs and to investigate, describe, and predict the effects of changes in a, h, and k on the graphs of $y = a(x - h)^2 + k$ form of a function.
4. Use complex numbers to describe the solutions of quadratic equations.

B. Quadratic Equations and Inequalities
1. Formulate quadratic equations and inequalities to solve problems.
2. Solve quadratic equations and inequalities including solutions from the complex number system.
3. Analyze the solutions of quadratic equations using discriminants and solve quadratic equations using the quadratic formula.
4. Using graphing calculators and computer algebra systems, compare and translate between algebraic and graphical solutions of quadratic equations.

C. Radical Functions and Absolute Value Functions
1. Represent radical and absolute value functions in algebraic, tabular, graphical, and verbal forms using paper and pencil, graphing calculators, computer algebra, and spreadsheet technologies.
2. Solve square root and absolute value equations and inequalities using graphs, tables, and algebraic methods. Verify solutions using graphing calculators, computer algebra systems, and spreadsheets.
3. Analyze situations modeled by square root and absolute value functions, formulate equations or inequalities, and solve problems.

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IV. Rational and Exponential Functions

A. Rational Functions
   1. Represent rational functions in algebraic, tabular, graphical, and verbal forms using paper and pencil, graphing calculators, computer algebra, and spreadsheet technologies.
   2. Solve problem situations using direct and inverse variation.

B. Exponential Functions
   1. Represent exponential functions in algebraic, tabular, graphical, and verbal forms using paper and pencil, graphing calculators, computer algebra, and spreadsheet technologies.
   2. Analyze a situation modeled by an exponential function, formulate an equation or inequality, and solve the problem.